Aerosols Help Heat Up the Yangtze River Delta in China

Research Highlight

A team of scientists found that aerosols significantly alter the vertical profile of solar heating in the central Yangtze River Delta region in eastern China. Aerosols were identified from as far away as Mongolia and Siberia. These findings have considerable implications for atmospheric stability and dynamics within the lower troposphere.

Researchers analyzed four years of aerosol optical properties and a one-year vertical profile of aerosol particle extinction. They studied seasonal variations of aerosol optical properties, vertical distribution, and influence on shortwave radiation and heating rates. The team analyzed multi-year variations of aerosol optical depths (AOD), Ångstrom exponents, single scattering albedo (SSA), and asymmetry factor (ASY), together with the vertical profile of aerosol extinction. They found AOD to be largest in summer and smallest in winter. SSAs exhibit weak seasonal variation, with the smallest values occurring during winter and the largest during summer. The vast majority of aerosol particles are below 2 km, and a majority are confined to below 1 km.

Some aerosols aloft were traced back to northern/northwestern China, as far as Mongolia and Siberia, in spring, autumn, and winter. They identified dust aerosols based on the linear depolarization measurements and other information. Dust strongly impacts the vertical particle distribution in spring and autumn, with much smaller effects in winter. The team calculated the annual mean aerosol direct shortwave radiative forcing (efficiency) at the bottom, top, and within the atmosphere. They also found a mean reduction in direct and diffuse radiation reaching the surface.

Reference(s)

Liu J, Z Li, Y Zheng, C Flynn, and M Cribb. 2012. "Seasonal variations of aerosol optical properties, vertical distribution and associated radiative effects in the Yangtze Delta region of China." Journal of Geophysical Research, 117, D00K38, doi:10.1029/2011JD016490.

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Aerosol Life Cycle